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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,003	08/10/2006	Tadashi Itoh	1035-646	4549

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EXAMINER
LEE, JAE

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2823	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

TH

Office Action Summary	Application No.	Applicant(s)	
	10/589,003	ITOH ET AL.	
	Examiner	Art Unit	
	Jae Lee	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08/10/2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 August 2006* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :01/30/2007,10/06/2006,08/10/2006.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claim 11** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 11, line 5-6 refers to "a film thickness of the group I-VII semiconductor single crystal thin film". It is uncertain whether or not the group I-VII semiconductor single crystal thin film refers to the layer formed while irradiating the electron beam, the layer formed while not irradiating the electron beam, or the combination of the two layers. Examiner takes the position of "a film thickness of the group I-VII semiconductor single crystal thin film" as the combination of the two layers.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. **Claims 1,3-8,10-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over R. Stanley Williams, David k. Shuh, and Yusaburo Segawa ("Growth and luminescence spectroscopy of a CuCl quantum well structure", American Vacuum Society, Journal of Vacuum Science and Technology A 6(3), May/Jun 1988, pgs 1950-1952, hereinafter Williams et al.) in view of Yakshin et al. (Pub No. US 2005/0150758 A1, hereinafter Yakshin et al.) and further in view of Taniguchi et al. (Pub No. US 2004/0191645 A1, hereinafter Taniguchi et al.).

With regards to **claim 1**, Williams et al. teaches a group I-VII semiconductor crystal thin film formed on a substrate made from ionic crystals,

The group I-VII semiconductor crystal thin film being formed on a buffer layer while a beam is irradiated on the group I-VII semiconductor crystal thin film, the buffer layer being for alleviating distortion caused due to a difference in lattice constant between the substrate and the group I-VII semiconductor crystal film (see Experimental Procedure, ¶1, lines 13-16, buffer layer CaF_2 serves as structural template, Results and Discussion, ¶2, lines 1-3).

Williams et al., however, does not teach the beam to be an electron beam.

In the same field of endeavor, Yakshin et al. teaches how utilizing an electron beam has the advantage of producing high quality films without intermixing with underlying layers (see ¶37, lines 14-16).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to utilize an electron beam to produce high quality CuCl films without intermixing with underlying layers (e.g. the buffer layer CaF_2).

Williams et al., however, does not teach the semiconductor film to be single crystal.

In the same field of endeavor, Taniguchi et al. teaches how a single crystal structure will have better electron mobility than a polycrystalline crystal

structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

With regards to **claim 3**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in claim 1, comprising:

A layer formed while irradiating an electron beam thereon; and

A layer formed while not irradiating the electron beam thereon (see Yashkin et al., see ¶37, lines 1-5, 6-14).

With regards to **claim 5**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in **claim 1**, wherein:

A region formed while irradiating an electron beam thereon and a region formed while not irradiating the electron beam thereon are located different places when viewing the substrate in a direction vertical to its surface (see Yashkin et al., see ¶37, lines 1-5, 6-14, different techniques will deposit on different locations of the surface).

With regards to **claim 6**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in **claim 1** being a CuCl thin film (see Williams et al., Experimental Procedure, lines 13-16).

With regards to **claim 7**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in **claim 1** being a metal halide semiconductor thin film (see Williams et al., Experimental Procedure, lines 13-16).

With regards to **claim 8**, Williams et al. teaches a process for producing a group I-VII semiconductor crystal thin film on a substrate made from ionic single crystals, comprising:

forming a buffer layer on the substrate, the buffer layer being for alleviating distortion caused due to a difference in lattice constant between the substrate and the group I-VII semiconductor crystal thin film (see Results and Discussion, ¶2, lines 1-3; buffer layer CaF_2 serves as structural template); and

forming the group I-VII semiconductor crystal thin film while irradiating an electron beam on the buffer layer (see Experimental Procedure, ¶1, lines 13-16). Williams et al., however, does not teach the beam to be an electron beam.

In the same field of endeavor, Yakshin et al. teaches how utilizing an electron beam has the advantage of producing high quality films without intermixing with underlying layers (see ¶37, lines 14-16).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to utilize an electron beam to produce high quality CuCl films without intermixing with underlying layers (e.g. the buffer layer CaF_2).

Williams et al., however, does not teach the semiconductor film to be single crystal.

In the same field of endeavor, Taniguchi et al. teaches how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

With regards to **claim 10**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the process as set forth in **claim 8**, comprising:

forming a layer of the group I-VII semiconductor single crystal thin film while irradiating an electron beam thereon; and

forming the rest of the group I-VII semiconductor single crystal thin film while not irradiating the electron beam thereon (see Yashkin et al., see ¶37, lines 1-5, 6-14).

With regards to **claim 11**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the process as set forth in **claim 9**, wherein:

the layer formed while irradiating the electron beam thereon and the layer formed while not irradiating the electron beam thereon have film thicknesses that are decided in consideration of a film thickness of the group I-VII semiconductor single crystal thin film (see ¶37, lines 1-5; layer can also be formed without electron beam such as sputtering and magnetron sputtering, see ¶37, lines 6-14, film thickness of entire thin film must be considered to determine the thicknesses of the individual layers).

With regards to **claims 4,12**, the combination of Williams et al., Yakshin et al., and Taniguchi et al. teaches the limitations of **claims 1,8** for the reasons above.

The combination, however, does not teach the group I-VII semiconductor single crystal thin film as set forth having a film thickness that allows an internal electric field to be resonance-increased.

In the same field of endeavor, it would have been obvious to one of ordinary skill to determine the optimum film thickness to allow an electric field to be resonance-increased (see *In re Aller, Lacey, and Hall* (10 USPQ 233-237). It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom.

Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical (see *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990)).

With regards to **claims 13-15**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the limitations of **claim 8** for the reasons above.

The combination, however, does not teach the acceleration voltage in the range of 0-30 kV, the filament current in the range of 1-5 A, and the irradiation current in the range of 0-150 μA.

In the same field of endeavor, it would have been obvious to one of ordinary skill to determine the optimum acceleration voltage, filament current, and irradiation current (see *In re Aller, Lacey, and Hall* (10 USPQ 233-237). It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical (see *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990)).

5. **Claims 2,9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al. in view of Taniguchi et al.

With regards to **claim 2**, Yakshin et al. teaches a semiconductor crystal thin film comprising:

A layer formed while irradiating an electron beam thereon; and

A layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5; layer can also be formed without electron beam such as sputtering and magnetron sputtering, see ¶37, lines 6-14).

Yashkin et al., however, does not teach the semiconductor thin film to be single crystal.

In the same field of endeavor, Taniguchi et al. teaches how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

With regards to **claim 9**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches a process for producing a group I-VII semiconductor single crystal thin film, comprising:

forming a layer of the group I-VII semiconductor single crystal thin film while irradiating an electron beam thereon; and

forming the rest of the group I-VII semiconductor single crystal thin film while not irradiating the electron beam thereon (see ¶37, lines 1-5; layer can also be formed without electron beam such as sputtering and magnetron sputtering, see ¶37, lines 6-14).

Yashkin et al., however, does not teach the semiconductor thin film to be single crystal.

In the same field of endeavor, Taniguchi et al. teaches how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

a. Wang et al. (USP# 6,380,050 B1)

b. Kinder et al. (Pub NO. US 2001/0007707 A1)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jae Lee whose telephone number is 571-270-1224. The examiner can normally be reached on Monday - Friday, 7:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JML

LEX MALSAWMA
PRIMARY PATENT EXAMINER